The Office rejected Claims 5/1, 6/1, 7/1, 14/1, and 15/1 under 35 U.S.C. § 103(a) as being unpatentable over *Ono, Corbett, or Martin.*

The Office rejected Claims 5/2, 6/2, 7/2, 14/2, and 15/2 under 35 U.S.C. § 103(a) as being unpatentable over *Hatamura.*

The Office objected to Claims 9-11, but gave no basis for the objection.

Applicants have amended Claim 1 to recite a "rotary actuator operatively connected to at least one anchor link." Support for this amendment is found in Claim 9 and in the Specification at page 6, line 26, through page 8, line 4.

Applicants have amended Claim 2 to recite "wherein at least one actuator is selected from the group consisting of electrostatic actuators, electromagnetic actuators, and thermal actuators." Support for this amendment is found in Claim 8 and in the Specification at page 6, lines 18-25.

Applicants have amended Claim 10 to depend from Claim 1. Support for this amendment is found in Claim 9 and in the Specification at page 6, line 26, through page 8, line 4.

Applicants have amended Claim 11 to depend also from Claim 1. Support for this amendment is found in the Specification at page 7, lines 28-29.

No new matter is added by these amendments.

SUMMARY OF THE INVENTION

The present invention is directed to a microelectromechanical positioner to achieve substantially translational positioning of a platform without rotational motion. The micropositioner comprises a substrate, a moveable platform, and a linkage mechanism. The linkage mechanism is pivotably attached to the substrate by at least two anchor links and pivotably attached to the moveable platform by at least two platform links. The microelectromechanical positioner can further comprise at least one actuator operatively connected to the linkage mechanism, anchor link, platform link, or the platform. The at least one actuator can be a rotary actuator operatively connected to at least one anchor link.

SUMMARY OF THE ART

Ono, U.S. Patent 5,089,740, discloses a displacement generating apparatus comprising a first and a second displacement generating devices of substantially the same length and having one end fixed

to a common member. A third displacement generating device is attached to the other end of each of the first and second devices such that the third device is arranged perpendicular to the first and second devices. The displacement generating devices can be bimorph-type piezoelectric elements.

Corbett, U.S. Patent 3,526,726, discloses a device to position, e.g., the reproduce head of a magnetic tape recorder/reproducer in relationship to the magnetic tape passing adjacent thereto. The head is suspended by a pair of piezoelectric transducers comprising plates placed parallel with their top longitudinal ends joined to an inverted U-shaped support member.

Martin, U.S. Patent 3,835,338, discloses an electrically controlled ultra-micromanipulator comprising a linear actuating assembly adapted to effect linear movement of a probe. The linear actuating assembly has pairs of electrostrictive elements that establish linear longitudinal movement of a carrier plate.

Hatamura, U.S. Patent 4,686,440, discloses a fine positioning device comprising a parallel flexible-beam displacement mechanism consisting of plural parallel flexible beams connecting first and second rigid portions and an actuator adapted to have the plural flexible beams undergo bending deformation to obtain fine linear displacement of the mechanism. The mechanism is actuated by a piezoelectric actuator.

ARGUMENT

CLAIMS 1, 3, 4, 12, AND 13, LIMITED TO A ROTARY ACTUATOR, ARE NOT ANTICIPATED BY *ONO, CORBETT, OR MARTIN* UNDER 35 U.S § 102(a)

The Office rejected Claims 1, 3/1, 4/1, 12/1 and 13/1, asserting that *Ono* or *Martin* teach at least two anchor links, at least two platform links, a substrate, and a platform. To anticipate a claim, the reference must teach each and every element of the claim. *See* MPEP § 2131. Applicants submit that *Ono* or *Martin* do not anticipate amended Claim 1, because *Ono* or *Martin* do not teach a rotary actuator. Furthermore, the Office has not provided an explanation for the rejection of Claims 3, 4, 12, and 13 and therefore has not established a *prima facie* case for rejection of these claims. *See* MPEP § 707.07.

Ono, *Corbett*, and *Martin* all teach piezoelectric actuators that provide linear force. *See Ono*, col. 4, line 44, through col. 5, line 2, and *Martin*, col. 4, lines 7-35. Conversely, Applicants' amended Claim 1 recites a rotary actuator. Applicants' rotary actuator enables the use of fixed location

actuators to provide motion of the anchor links about an arc. *See* Application, page 6, line 26, through page 7, line 3. Since *Ono*, *Corbett*, or *Martin* do not teach or suggest the limitation of a rotary actuator, alone or in combination, Applicants submit that this rejection is overcome and that amended Claim 1 is now in condition for allowance. Claims 3, 4, 12, and 13, which depend from Claim 1, are also in condition for allowance. *See* MPEP § 2143.03.

CLAIMS 2, 3, 4, 12, AND 13, LIMITED TO AN ACTUATOR SELECTED FROM THE GROUP CONSISTING OF ELECTROSTATIC, ELECTROMAGNETIC, OR THERMAL ACTUATORS, ARE NOT ANTICIPATED BY *HATAMURA* UNDER 35 U.S § 102(a)

The Office rejected Claims 2, 3/2, 4/2, 12/2 and 13/2, asserting that *Hatamura* teaches a substrate, a platform, anchor links, and platform links. To anticipate a claim, the reference must teach each and every element of the claim. *See* MPEP § 2131. Applicants submit that *Hatamura* does not anticipate amended Claim 2, because *Hatamura* does not teach an electrostatic, electromagnetic, or thermal actuator. Furthermore, the Office has not provided an explanation for the rejection of Claims 3, 4, 12, and 13 and therefore has not established a *prima facie* case for rejection of these claims. *See* MPEP § 707.07.

Hatamura teaches a piezoelectric actuator that provides linear force. *See Hatamura*, col. 6, lines 41-55. Conversely, Applicants' amended Claim 2 recites an electrostatic, electromagnetic, or thermal actuator. *See* Application, page 6, lines 18-25. These actuators taking advantage of surface/volume scaling laws to provide micron-size displacements with low force. Since *Hatamura* does not teach or suggest the limitation of an electrostatic, electromagnetic, or thermal actuator, Applicants submit that this rejection is overcome and that amended Claim 2 is now in condition for allowance. Claims 3, 4, 12, and 13, which depend from Claim 2, are also in condition for allowance. *See* MPEP § 2143.03.

CLAIMS 5, 6, 7, 14, and 15, LIMITED TO A MICROPOSITIONER COMPRISING MEMS MATERIALS, ARE UNPATENTABLE OVER *ONO, CORBETT, OR MARTIN* UNDER 35 U.S § 103(a)

The Office rejected Claims 5/1, 6/1, 7/1, 14/1 and 15/1 in view of *Ono*, *Corbett*, or *Martin*, asserting that the selection from among known materials has long been held to be within the skill expected of the routineer. To establish a *prima facie* case of obviousness, *inter alia*, the prior art must teach or suggest all of the claim limitations. *See* MPEP §2143. Applicants submit that *Ono, Corbett, or Martin,* do not teach or suggest, alone or in combination, a micropositioner comprising

microelectromechanical systems (MEMS) materials. Accordingly, Applicants submit that Claims 5, 6, and 7 are not obvious in view of *Ono, Corbett, or Martin*.

The *Ono, Corbett, or Martin* devices contemplates conventional structural materials (e.g., metals), whereas the present invention teaches, and Claims 5-7 recite, silicon, polycrystalline silicon, and silicon nitride, materials that are used exclusively in the integrated circuits industry and in MEMS. As such, the micropositioner of the present invention is fabricated monolithically on a silicon-based material substrate using semiconductor lithographic techniques known to those skilled in the art of MEMS. Furthermore, the micropositioner built using the MEMS technology is a substantially planar device. Traditional positioning devices, such as those disclosed by *Ono*, *Corbett*, and *Martin*, are three-dimensional. Therefore, it would not have been obvious for a person skilled in the art of conventional structural materials to substitute silicon-based materials for their positioner. Accordingly, Applicants submit that this rejection is overcome and that Claims 5-7 are in condition for allowance.

Applicants have argued, *supra*, that amended Claim 1 is now in condition for allowance. Accordingly, Applicants submit that Claims 14 and 15, which depend from Claim 1, are also in condition for allowance. *See* MPEP § 2143.03.

CLAIMS 5, 6, 7, 14, and 15, ARE NOT UNPATENTABLE OVER *HATAMURA* UNDER 35 U.S § 103(a)

The Office rejected Claims 5/2, 6/2, 7/2, 14/2 and 15/2 in view of *Hatamura*. To establish a *prima facie* case of obviousness, *inter alia*, the prior art must teach or suggest all of the claim limitations. *See* MPEP §2143. The Office has not provided an explanation for this rejection and, therefore, has satisfied its burden of providing factual support for a *prima facie* conclusion of obviousness in view of *Hatamura*. *See* MPEP §2142. Accordingly, Applicants submit that this rejection is overcome and that Claims 5, 6, 7, 14, and 15 are in condition for allowance.

THE OFFICE HAS NOT PROVIDED A BASIS FOR ITS OBJECTION TO CLAIMS 9-11

The Office objected to Claims 9-11. However, the Office did not provide a basis or explanation for this objection in the Detailed Action. Accordingly, Applicants are unable to respond to this objection. Nevertheless, Applicants have amended Claim 1 to included the limitation of Claim 9, cancelled Claim 9, amended Claim 10 to depend from Claim 1, and amended Claim 11 to depend from Claims 1 or 2.

CONCLUSION

Applicant has responded to each and every requirement and urge that the claims as presented are now in condition for allowance. Applicant requests expeditious processing to issuance.

Respectfully submitted,

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CERTIFICATION UNDER 37 CFR 1.8

I hereby certify that this correspondence and documents referred to herein were deposited with the United States Postal Service as first class mail addressed to: Assistant Commissioner for Patents, Washington, DC 20231 on the date shown below.

DATE: 2/3/03 BY: Maricha Trujillo

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS

Claims 1, 2, and 10-11 have been amended as follows:

1. (amended) A microelectromechanical positioner, comprising:

a substrate;

a moveable platform;

at least one linkage mechanism having a plurality of links, wherein the linkage mechanism is pivotably attached to the substrate by at least two anchor links and pivotably attached to the moveable platform by at least two platform links, and whereby the platform is constrained to exhibit substantially translational movement in a plane; and

at least one rotary actuator operatively connected to at least one anchor link to provide motion thereto.

2. (amended) A microelectromechanical positioner, comprising:

a substrate;

a moveable platform;

at least one linkage mechanism having a plurality of links, wherein the linkage mechanism is pivotably attached to the substrate by at least two anchor links and pivotably attached to the moveable platform by at least two platform links, and whereby the platform is constrained to exhibit substantially translational movement in a plane; and

at least one actuator operatively connected to provide movement thereof to at least one of the group consisting of a linkage mechanism, an anchor link, a platform link, and the platform, wherein the at least one actuator is selected from the group consisting of electrostatic actuators, electromagnetic actuators, and thermal actuators.

10. (amended) The microelectromechanical positioner of Claim 1~~9~~, wherein the rotary actuator comprises an electrostatic actuator.

11. (amended) The microelectromechanical positioner of Claim 1 or 2, further comprising at least one spring operatively connected to the platform to restore the platform to a rest position in the absence of actuation of the actuator.